Sustainable Rivers Project
Alamo Dam & Bill Williams River

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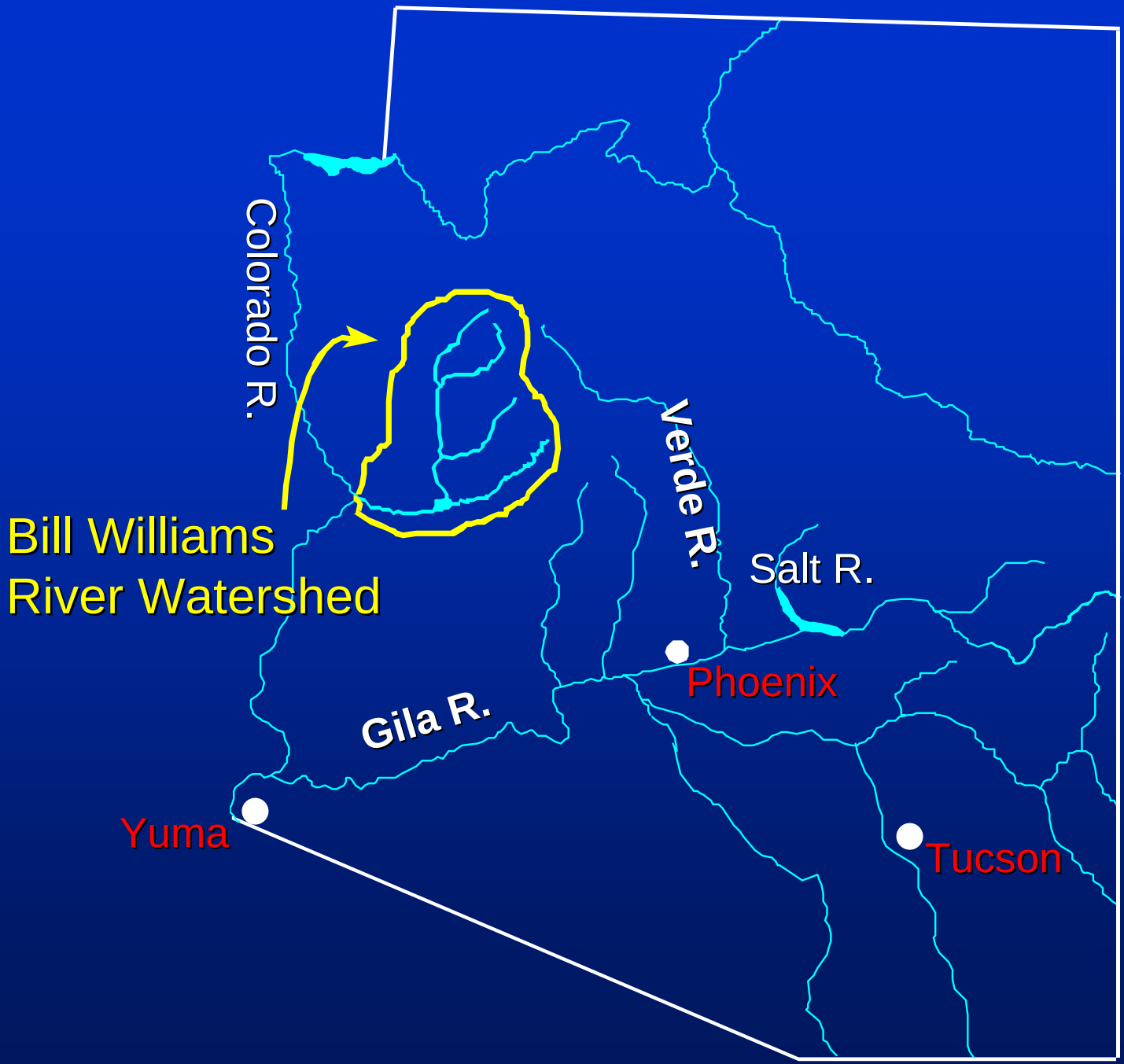
US Army Corps of Engineers®

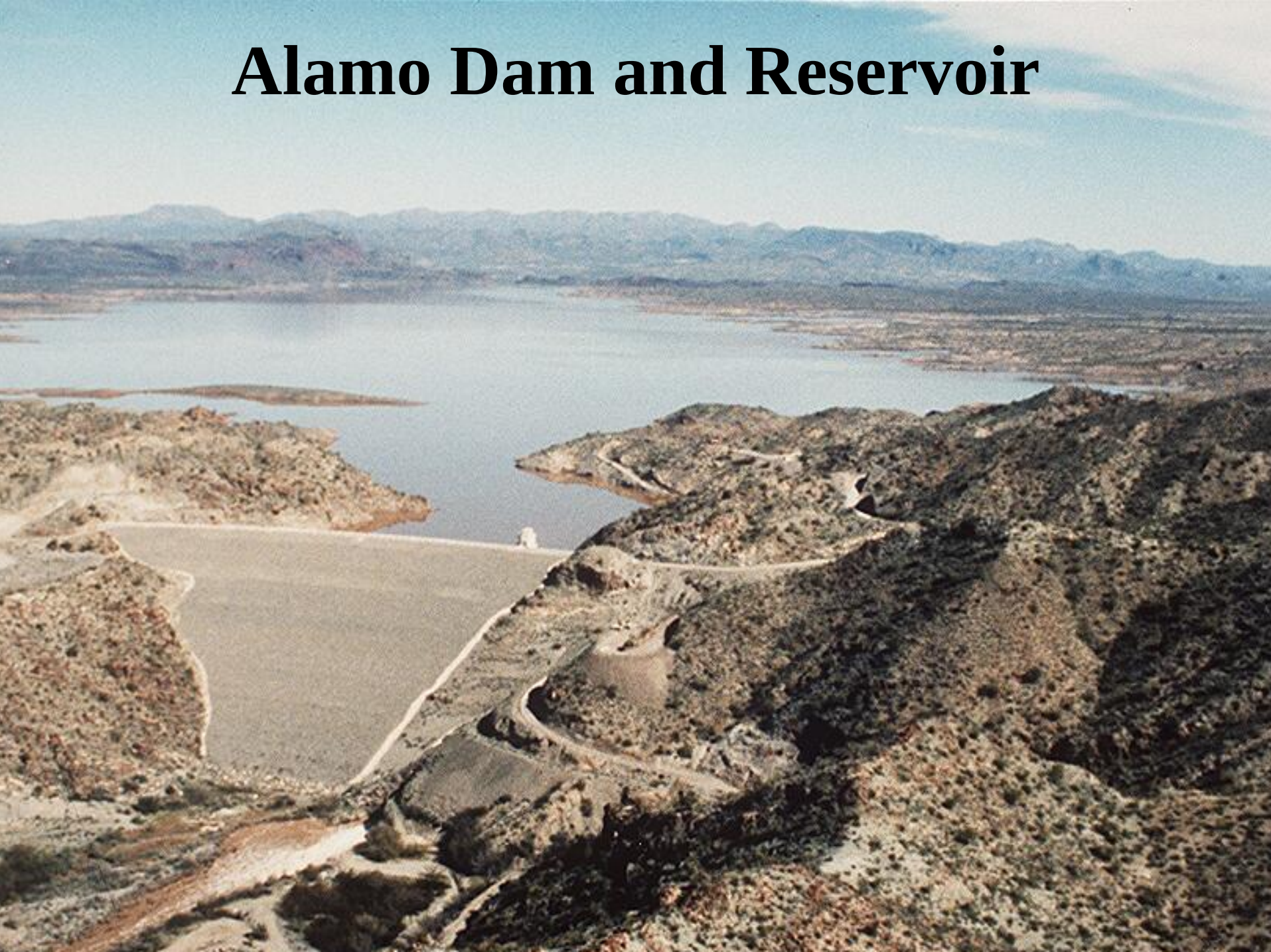
The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH

Outline of Presentation

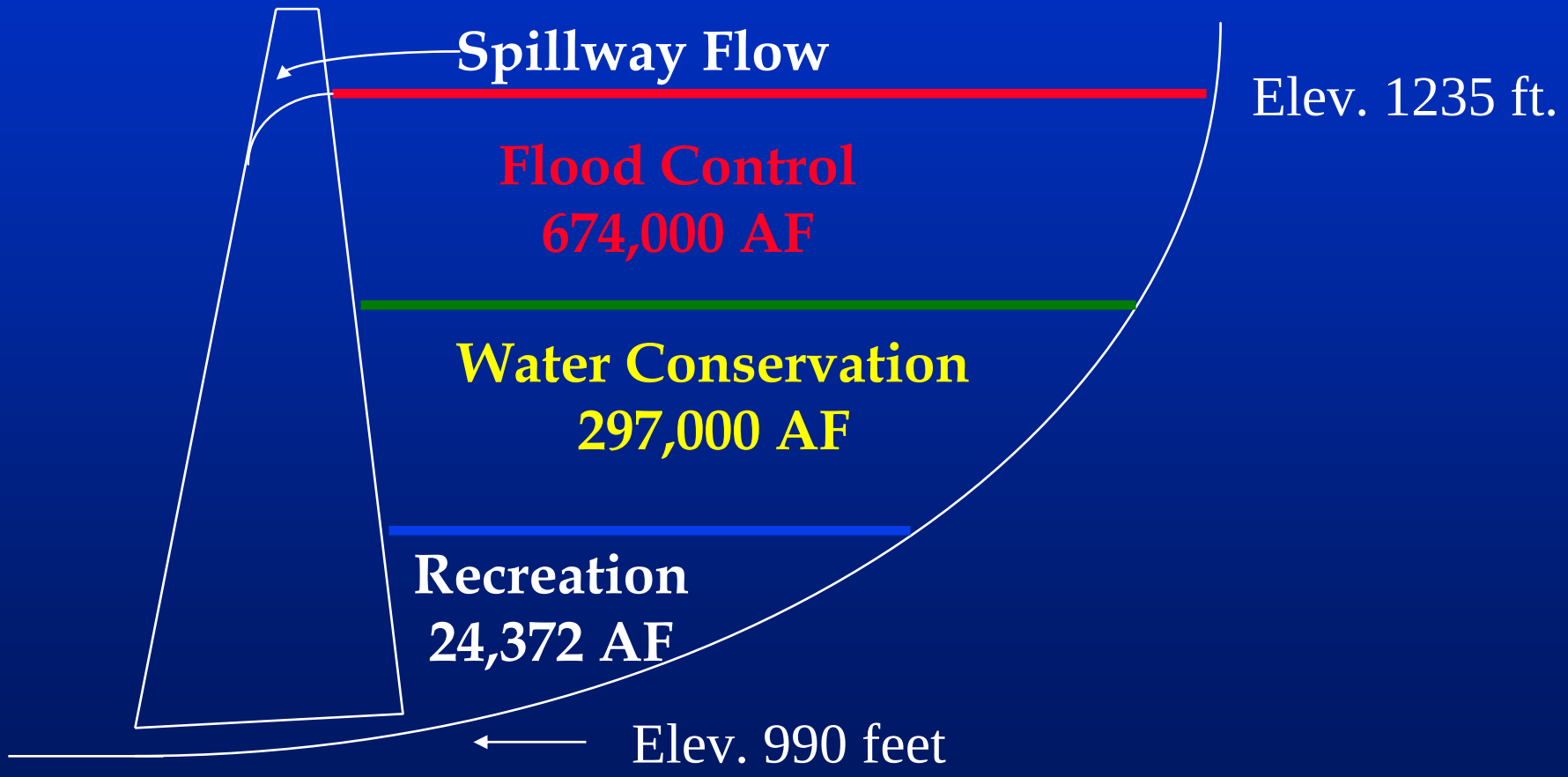
- Overview of Alamo Dam and watershed hydrology
- Bill Williams River Corridor (BWRC) and watershed biodiversity values
- BWRC Technical Committee process (1990-1994) and re-operation outcomes
- *Implementing the results of re-operation and adaptive management: Re-energized Bill Williams River Corridor Steering Committee (BWRCSC)*
- *Sustainable Rivers Project (SRP) integration into on-going BWRCSC efforts*
- *Recent BWRCSC/SRP activities*
- *SRP resources and challenges*


Colorado R.
Bill Williams
River Watershed
Verde R.
Salt R.
Phoenix
Gila R.
Yuma
Tucson

Alamo Dam and Reservoir



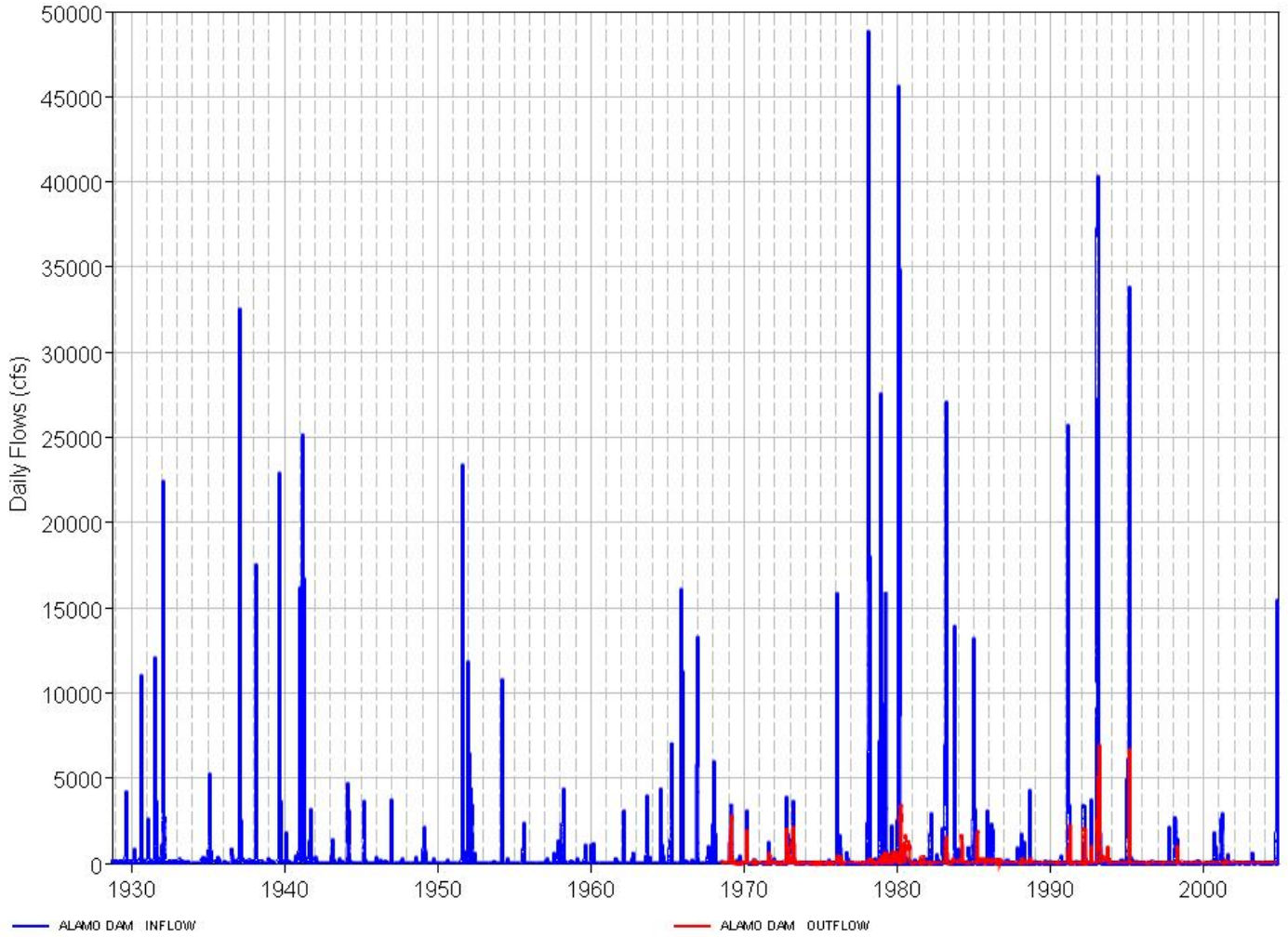
Alamo Dam Storage Allocations



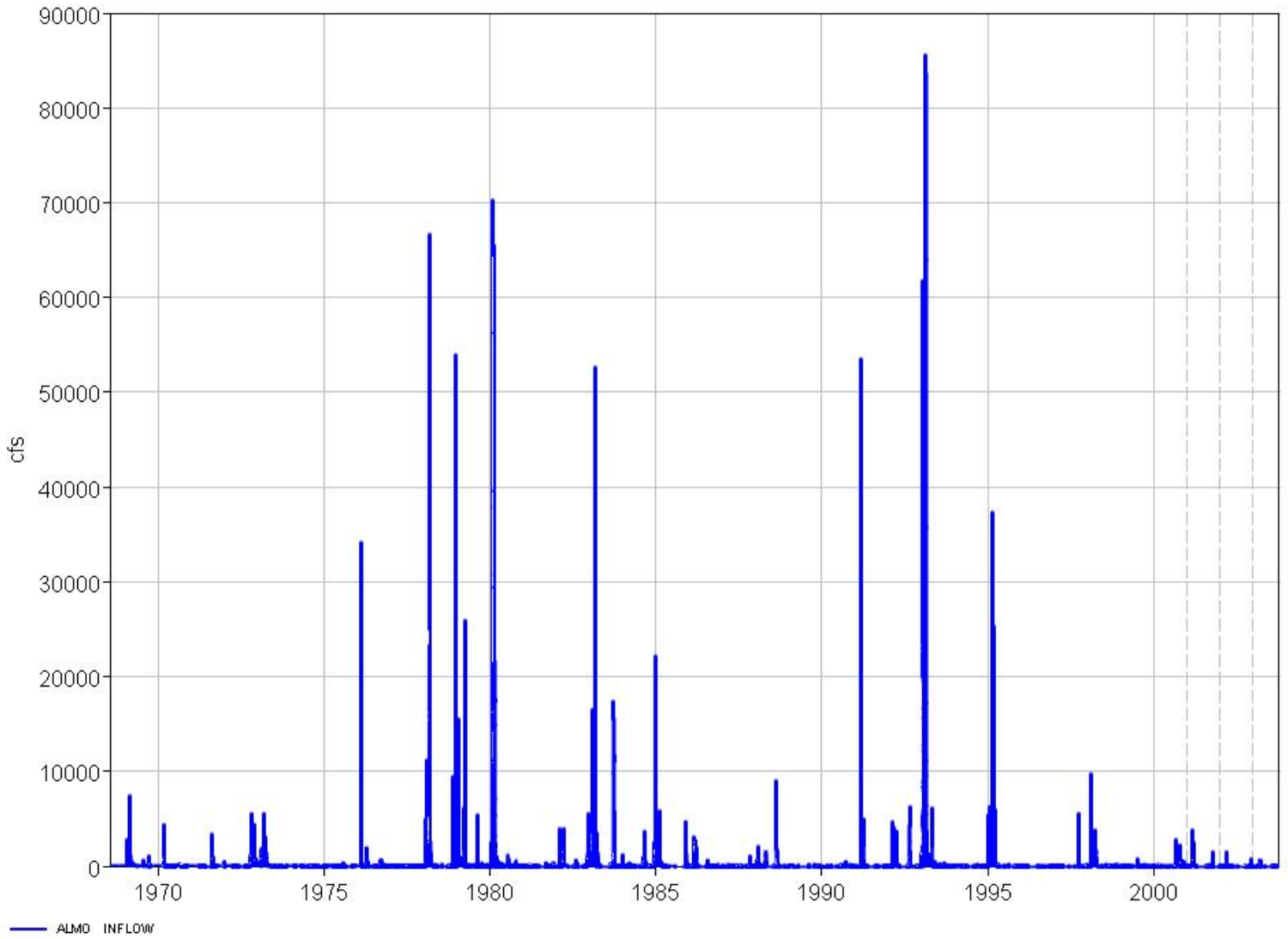
Alamo Dam & BWR Watershed

- Alamo Dam
  - Multi-purpose project completed in 1968
  - No consideration of riparian ecosystem needs in original reservoir operation plan
  - Total storage capacity = 1 million acre-feet
  - Maximum release = 7,000 cubic feet per second
- Watershed
  - Drainage area = 5,500 sq. mi.; 4,770 sq. mi. at dam
  - Watershed elevations = 450 to 8,266 feet
  - Average annual precipitation ranges = 4 to 22 inches
  - Approximate average annual runoff = 100,000 acre-feet

Alamo Dam Inflow & Outflow



Alamo Dam Inflow Hydrograph



Alamo Dam & BWR Corridor

Bill Williams River Geomorphology

- Wide alluvial channels & confined canyons
- Seasonality of low flows (i.e., seasonally intermittent vs. perennial)

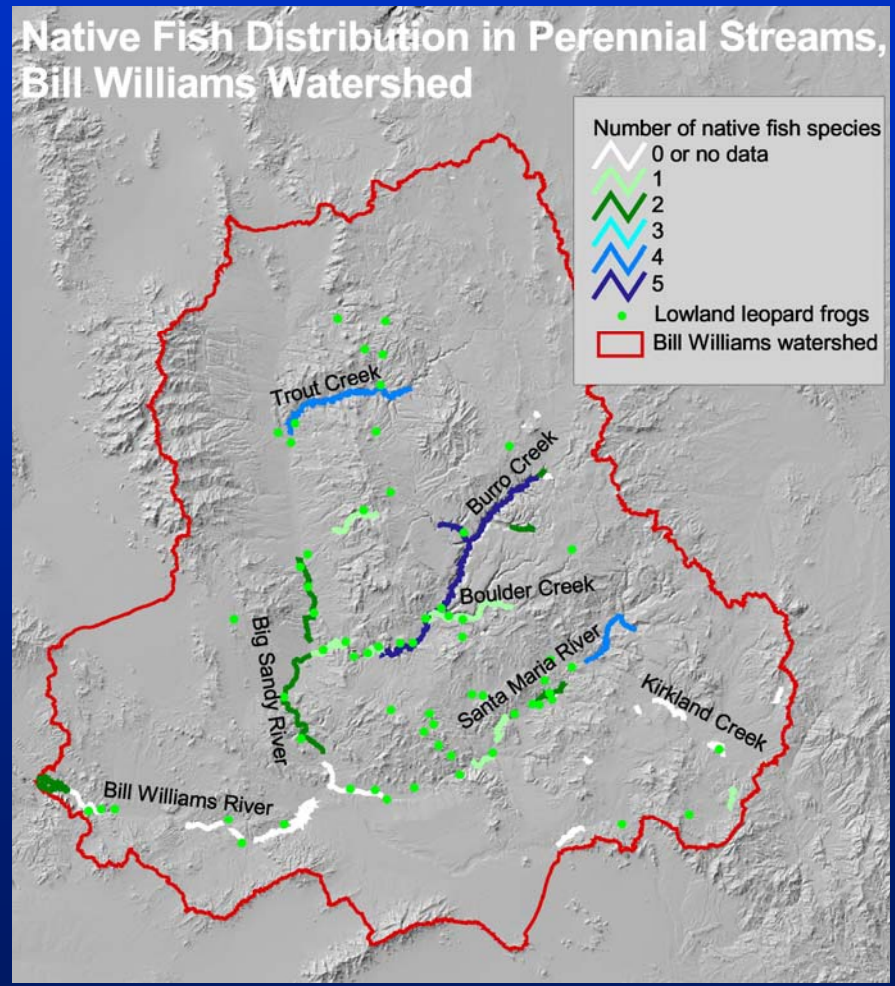
Riparian Habitat in BWR National Wildlife Refuge

BWR Corridor Biodiversity

- Disproportionately important ecological value due to riparian habitat losses on Lower Colorado River
- Best remaining native riparian woodland habitat on the Lower Colorado River (Cottonwood-Willow)
- More than 340 bird species on the Bill Williams River National Wildlife Refuge, including:
  - Southwestern willow flycatcher & Yuma clapper rail (federal listed)

BWR Watershed Biodiversity

- Encompasses portions of 12 ecoregional conservation areas (Sonoran Desert and Apache Highlands)
- 153 miles of perennial stream segments
- Three streams designated as Unique Waters of Arizona
- Nine native fish species in watershed; federal listed bonytail and razorback sucker reintroduced downstream of dam
- Lowland leopard frog populations without bullfrogs
- At least 10 globally rare species



Pre-SRP Chronology

- 1978-1986: High flow years; adverse impacts to BWR riparian habitat
- 1987: Bald Eagle nests ; ESA invoked
- 1990-1994: BWRCTC cooperative study
- 1995: All participating agencies sign BWRCTC re-operation recommendation
- 1996: Congress formally adds Fish &Wildlife purpose
- 1996-2000: Corps Reconnaissance & Feasibility Study to accomplish formal EIS process for re-operation
- Oct 2003: Updated Alamo Dam Water Control Manual approved

BWRCTC Member Agencies

- Arizona Game and Fish Department
- Arizona State Parks
- Arizona Department of Water Resources*
- Bureau of Land Management
- Bureau of Reclamation
- Corps of Engineers
- Fish and Wildlife Service

*Advisory capacity

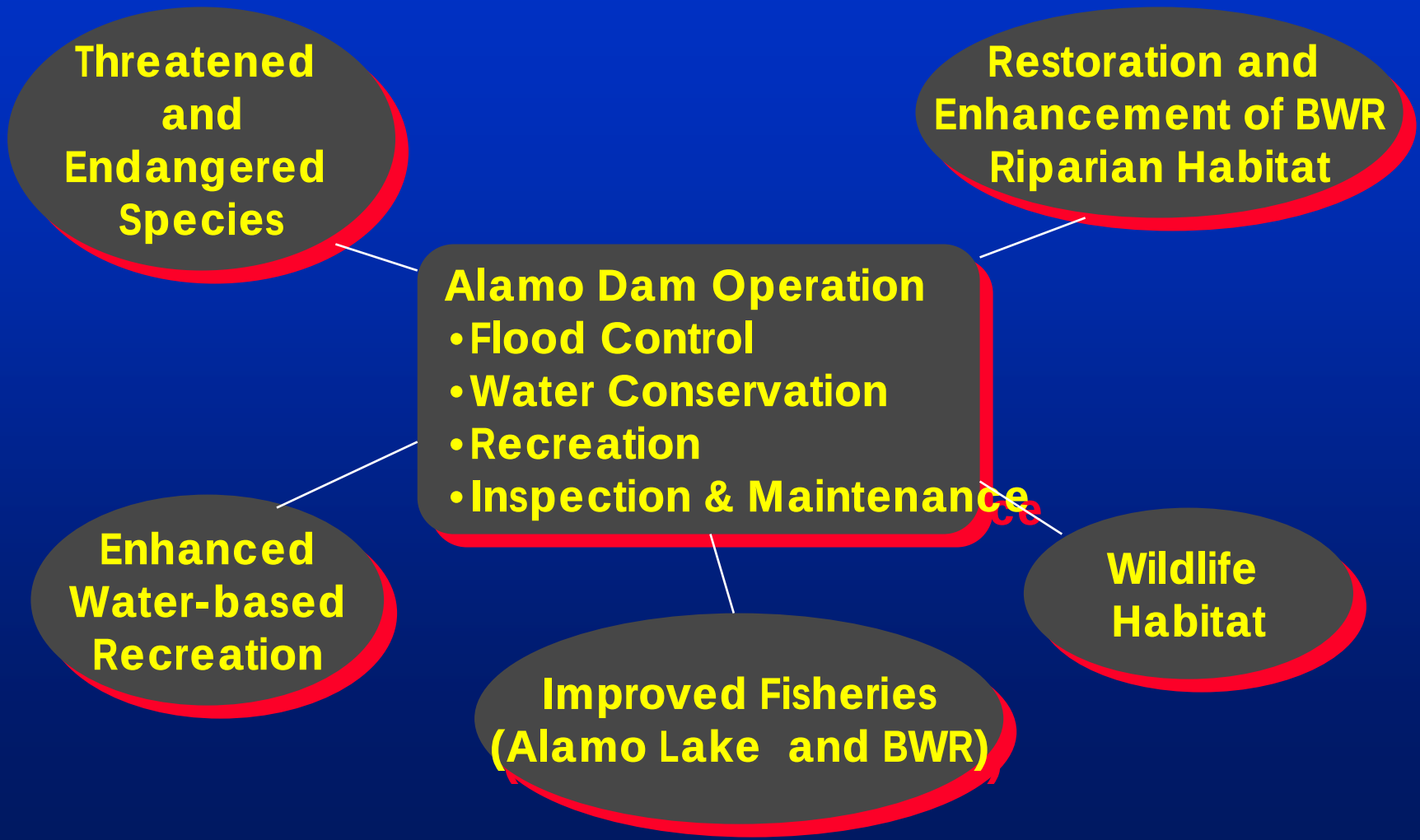
BWRCTC Goal

Carry out a coordinated interagency planning effort to develop an effective water management plan for Bill Williams River Corridor resources

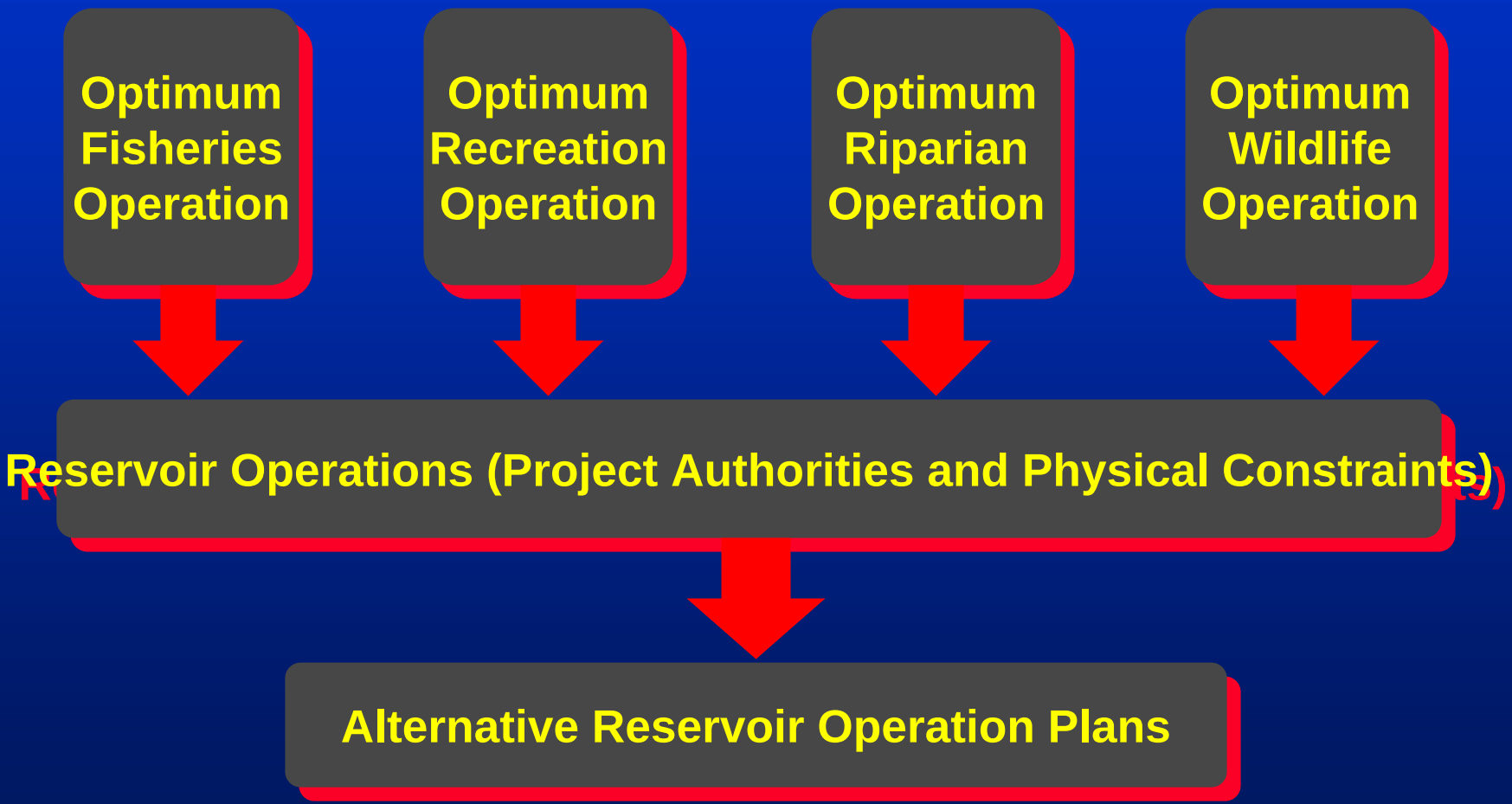
BWRCTC Process (1990-1994)

- Stakeholder collaboration
- Establish goals & objectives
- Define problems, needs, & opportunities
- Formulate alternatives
- Hydrologic and reservoir operation modeling
- Select appropriate evaluation criteria
- Reach a consensus based on analyzing model results vs. evaluation criteria & respect for mission and objectives of all parties
- Seek & obtain agency approvals to implement

Problems, Needs, and Opportunities



Formulation of Alternatives



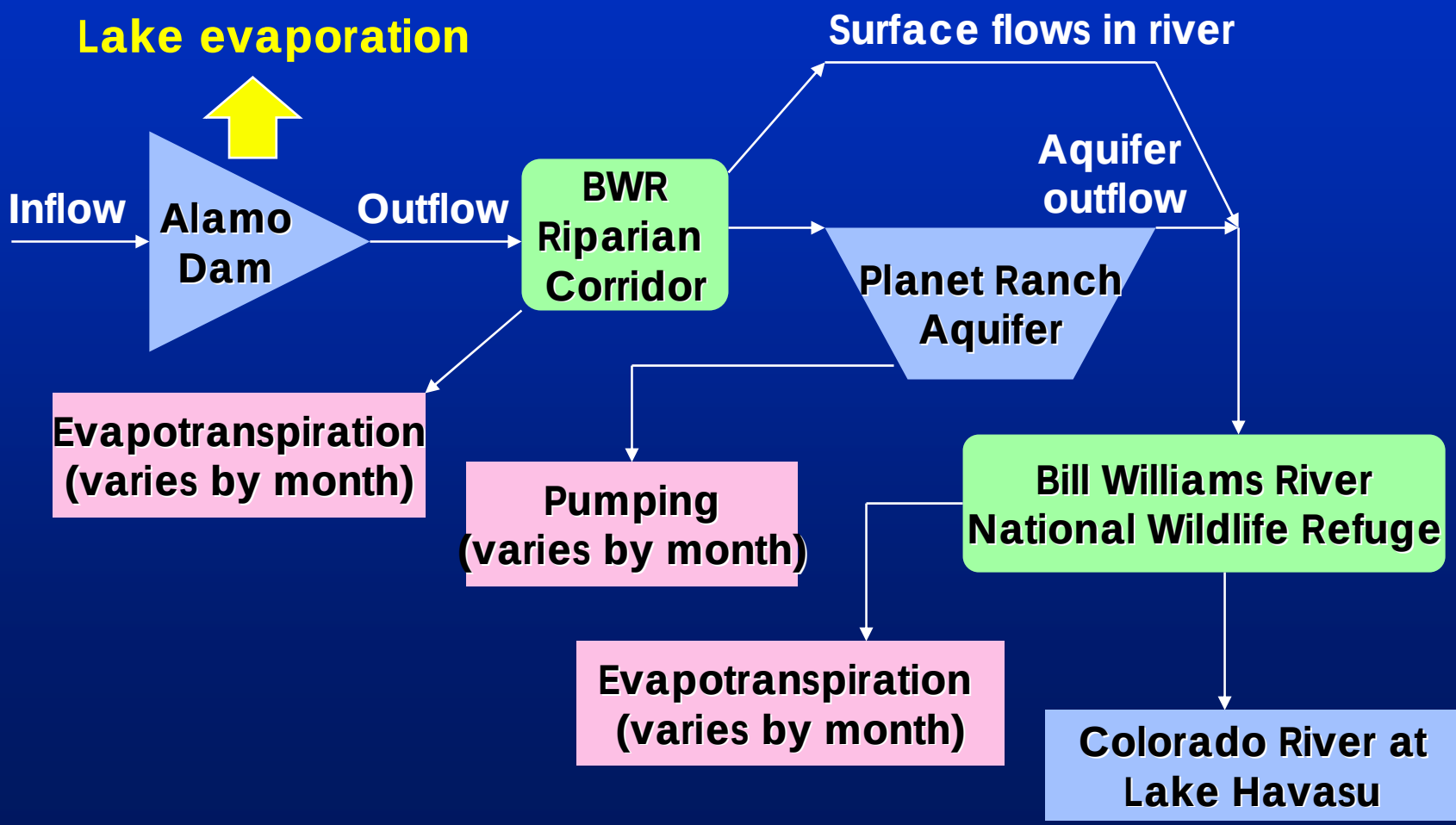
Selected Evaluation Criteria

- Recreation
  - RE3- Percent of time WSE at or above 1108 feet
  - RE4- Percent of time WSE between 1115 and 1125 feet
- Water Conservation
  - WC1- Average annual delivery of water to LCR in acre-feet
  - WC2- Average annual lake evaporation in acre-feet
- Flood Control
  - FC1- Number of days WSE above 1171.3 feet during 1929-93
  - FC2- Maximum percent of flood control space used 1929-93

Selected Evaluation Criteria (continued)

- Fisheries
  - F1- Percent of time WSE between 1110 and 1125 feet
  - F2- Percent of time March to May WSE fluctuates>2 inches per day
- Wildlife
  - W1- Percent of time WSE at or above 1100 feet
- Riparian
  - RA3- Percent of time Alamo releases > or = 25 cfs in Nov thru Jan
  - RA4- Percent of time Alamo releases > or = 40 cfs in Feb thru Apr, and Oct
  - RA5- Percent of time Alamo releases > or = 50 cfs in May thru Sep

Schematic of BWR Stream and Reservoir System

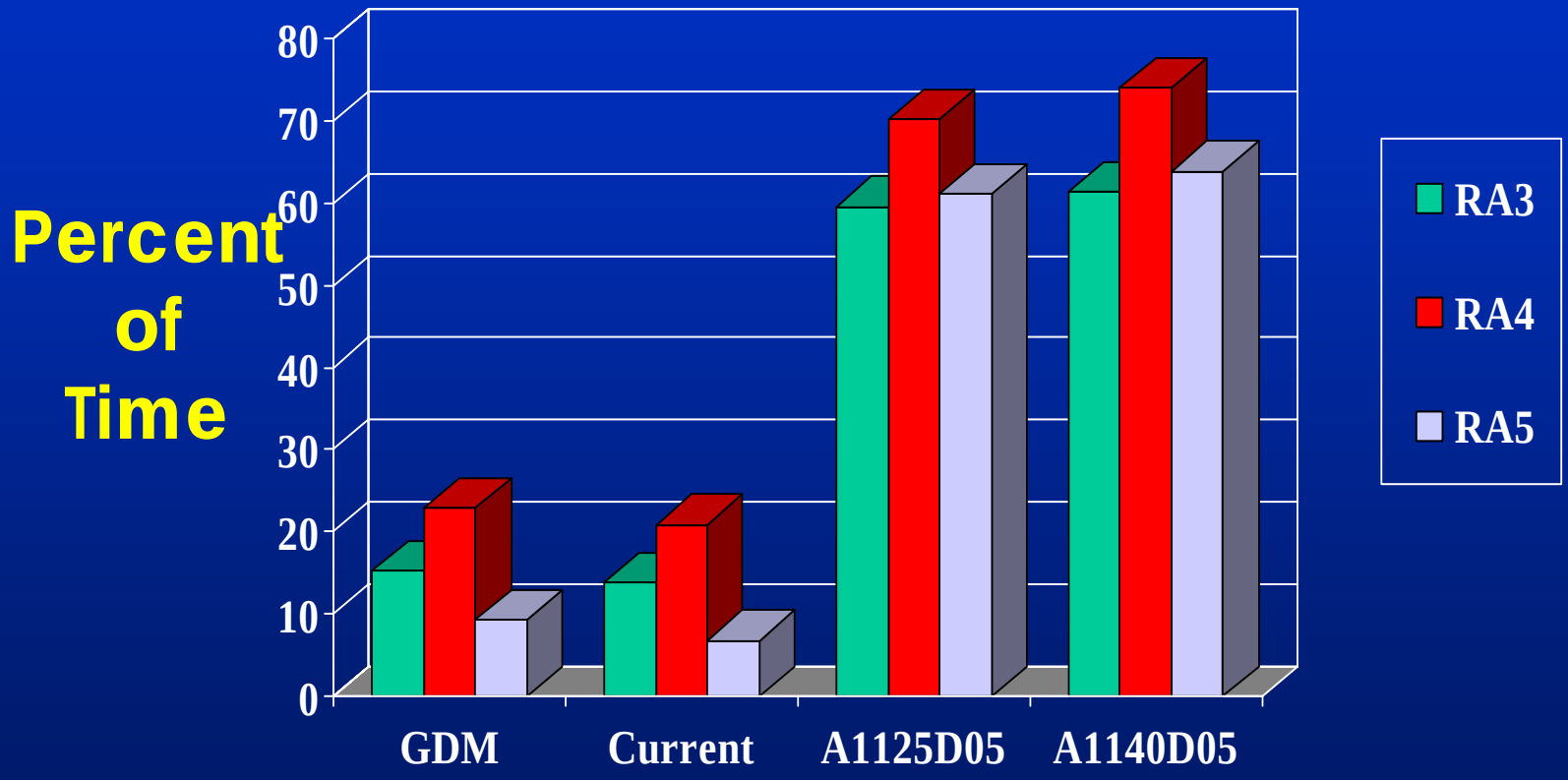


Partial Alternative Evaluation Summary

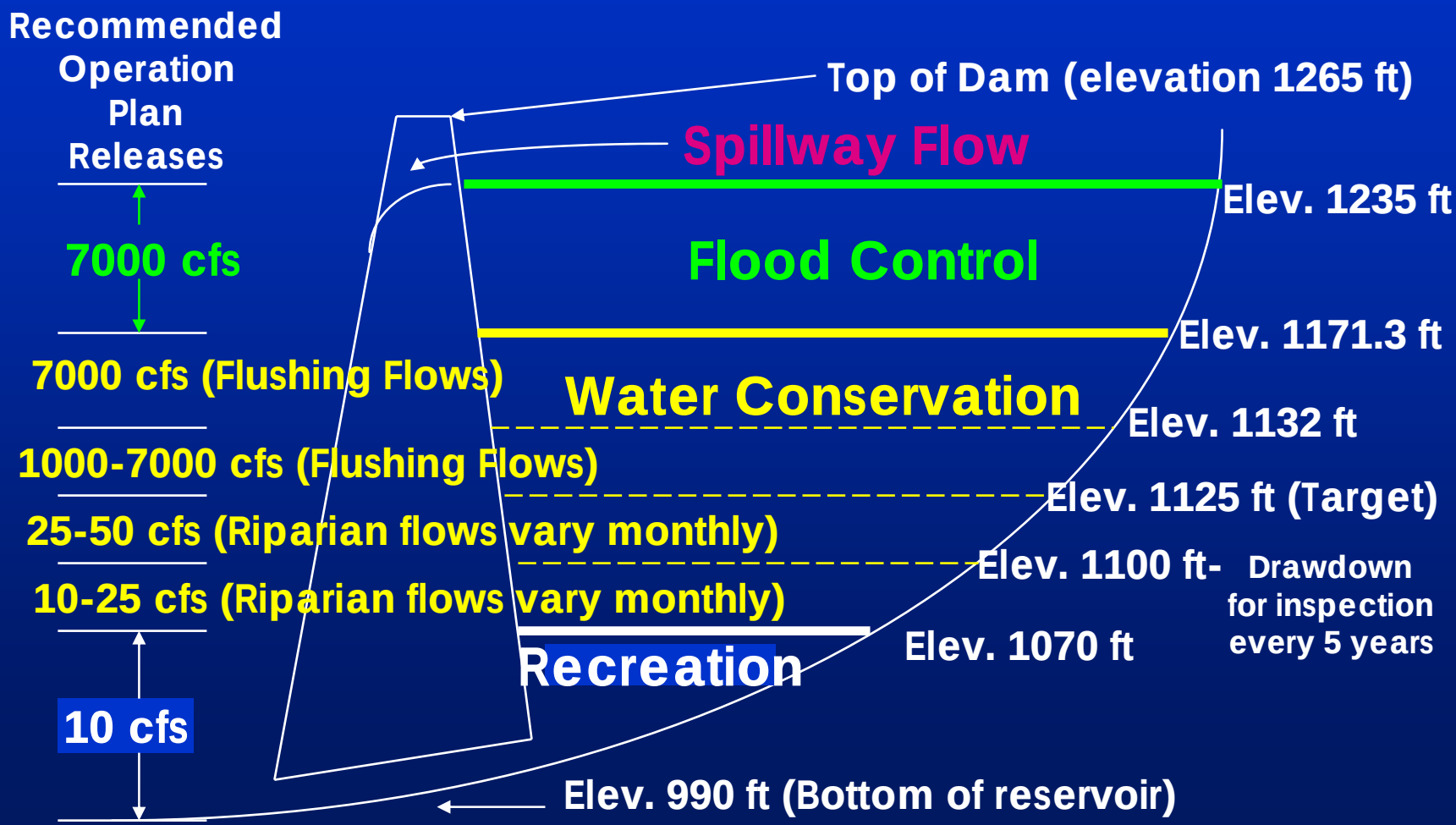
Alternative Operation Plans	Recreation		Water Conservation		Flood Control		Wildlife	Fisheries		Riparian		
	RE3 %	RE4 %	WC1 af	WC2 af	FC1 days	FC2 %	W1 %	F1 %	F2 %	RA3 %	RA4 %	RA5 %
GDM Plan	1.8	0.4	65322	5857	16	13.8	2.1	0.7	13.1	15.2	22.9	9.3
Current Oper	3.2	0.6	58735	13145	27	16.8	36.9	1.2	11.5	13.8	20.9	6.8
A1125D05	49.0	34.6	53174	16106	0	0	69.5	43.6	4.6	59.6	70.3	61.2
A1140D05	56.0	10.2	51267	17842	7	8.8	71.9	15.9	4.4	61.4	74.1	63.9

Evaluation criteria (RE3, RE4, WC1, FC1, F2, etc..) are specific measures of the performance of each alternative with respect to resource objectives established in the subcommittee reports.

Riparian Goals Summary [RA3, RA4, RA5]



Alamo Dam
Water Control Plan



Bill Williams River Corridor Technical Committee (1993)

Implementing Re-Operation and Adaptive Management

- Need
  - Develop and implement an integrated monitoring and adaptive management strategy and collect key baseline data to support
  - Account for previous uncertainties and new knowledge
  - Evaluate downstream ecosystem responses under the BWRCTC operating plan
  - Conduct hydraulic and groundwater modeling
- Response
  - Reconvene the BWRCTC as the Bill Williams River Corridor Steering Committee (BWRCSC)
  - Develop objectives and workplan

SRP/BWRCSC Chronology

- Dec 2000: MOU between Corps & the Conservancy signed
- 2002: Re-activation of BWRCSC
- July 2002: Sustainable Rivers Project initiated
- Oct 2002: Conservancy formerly added as member of BWRCSC
- FY02 to present: Ongoing BWRCSC activities

BWRCSC Member Organizations

- Arizona Game and Fish Department
- Arizona State Parks
- Arizona Department of Water Resources*
- Bureau of Land Management
- Bureau of Reclamation
- City of Scottsdale**
- Corps of Engineers
- Fish and Wildlife Service
- The Nature Conservancy (added in Oct 2002)

*Advisory capacity

**Short-term

BWRCSC Purpose*

The purpose of the [Bill Williams River Corridor] Steering Committee is to provide a collaborative, science-based framework that can inform decision-making and lead to:

(1) the preservation and enhancement of the last, best, intact riparian ecosystem in the Lower Colorado River corridor while addressing the flood control, recreation and water supply needs of current and future generations;

(2) identification of appropriate data needs and coordination and implementation strategies for maintaining and enhancing the overall health of the Bill Williams watershed.

*From the Memorandum of Understanding establishing the BWRCSC.

BWRCSC Objectives

- Build on BWRCTC work of 1990s
- Evaluate the performance of the BWRCTC water control plan used during the past decade
- Integrate the Conservancy/SRP's ecological approach & tools
- Consider the health of the entire watershed
- Reach out to other stakeholders: ranches, mining interests, Arizona Department of Environmental Quality, & upstream watershed NGO's
- Seek funding support in a coordinated manner

Sustainable Rivers Project Integration

- Work within the context of existing agency relationships and past accomplishments
- Bring new resources to the table
- Determine ecological flow requirements in a rigorous way to validate current operating plan assumptions and to prepare for an adaptive management strategy
  - Step 1 of Ecological Sustainable Water Management (ESWM)
  - Small group of experts convened and preparing relevant literature analysis and summary report
  - Flow workshop scheduled for February 2005
  - Other ESWM steps to follow

Sustainable Rivers Project Integration (continued)

- Facilitate access to more comprehensive ecological knowledge from experts
- Enable more detailed and contemporary descriptions of the physical (e.g., flow regime) & biotic (e.g., flow requirements) environment
- Provide a framework for developing and implementing an integrated monitoring & adaptive management plan
- Assist in creating a vision for establishing and maintaining watershed health

Recent BWRCSC/SRP Activities

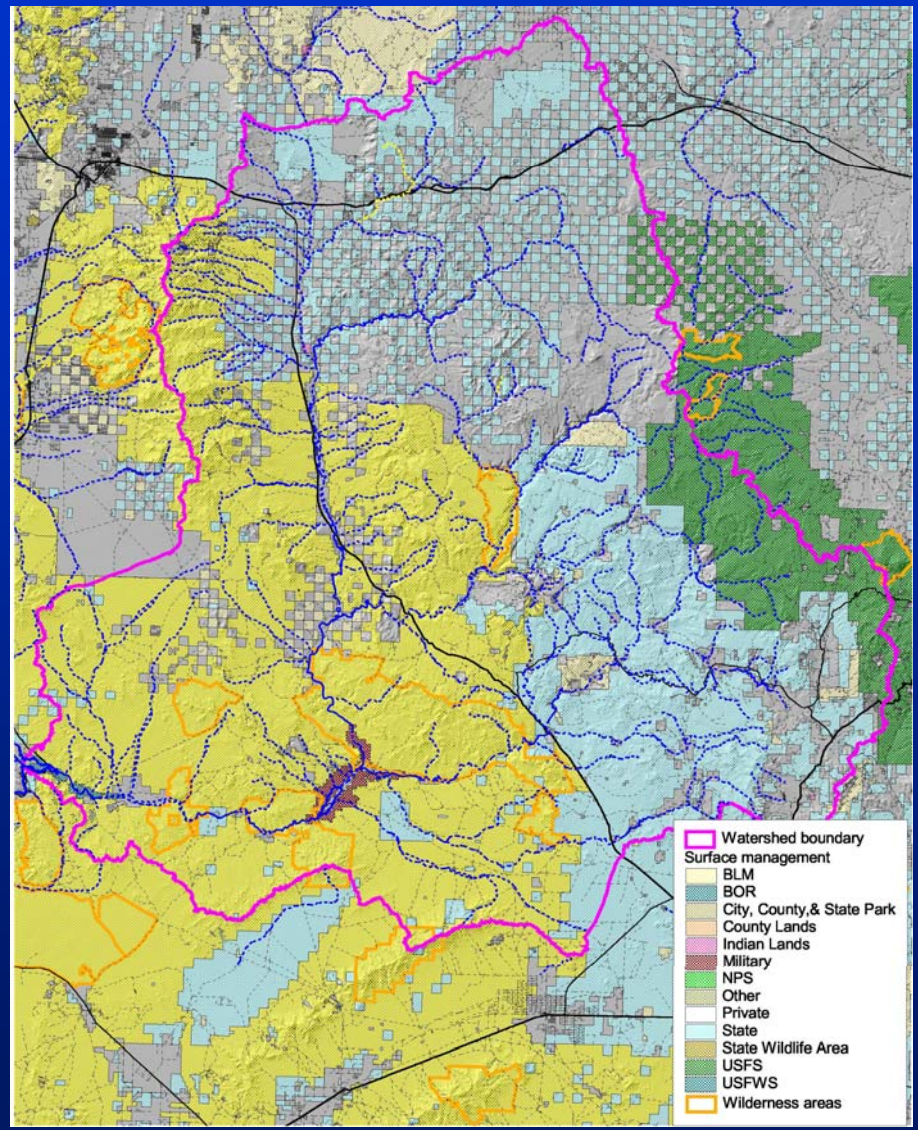
- Temporary US Geological Survey (USGS) downstream gaging stations on BWR established
- Planet Ranch groundwater aquifer testing & MODFLOW modeling
- Conservancy application of Indicators of Hydrologic Analysis (IHA) program to BWR downstream of Alamo Dam
- Assessment by Dr. Shafroth (USGS) of trends in the BWR riparian ecosystem (1953 to 2002)
  - Analysis focused on changes following high flow releases in mid 1990s
- Assembly of team of biological and geomorphic experts to address ecological flow requirements
- “Lobbying” of Congress & HQUSACOE for additional O&M funding for BWRCSC/SRP efforts

SRP Resources

- Corps authorities for SRP efforts
  - O&M authority use for SRP activities (e.g., Bill Williams River/Alamo Dam)
  - Feasibility study authority (1970 Flood Control Act, Section 216)
  - Other types of Corps authorities (e.g., Water Resources Development Act of 1986; Sections 906 or 1135)?
- Downstream ecosystem management activities are legitimate Corps O&M actions
- SRP priority within Corps O&M budget is needed
- Adequate Conservancy staff/resource support is needed

SRP Challenges

- Adaptive management and ecosystem monitoring are long-term efforts that require ongoing resource support
- Watershed health may be a necessary precursor to the maintenance of dam-regulated ecologically relevant flows
- SRP must work within a broader community of stakeholders



FY2006 Additional O&M Funding Request to Congress

- Total need of $600K (Corps request-$450K; non-Corps-$150K)
  - Establish permanent hydraulic cross-sections ($150K)
  - Digital terrain model for BWR floodplain ($150K)
  - Hydrologic & hydraulic modeling ($50K)
  - Geophysical aquifer characterization ($100K)
  - Sediment budget & geomorphic analysis ($50K)
  - Water budget assessment ($100K)
- Since FY02 BWRCSC members have invested at least $470,000 in project activities

Bill Williams River

Riparian Habitat in BWR National Wildlife Refuge